

99/F 044

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Patent claims

1. A sulfonated aromatic polymer comprising the repeating structural unit of the formula (I)



in which Ar^1 and Ar^2 are, independently of one another, divalent aromatic or heteroaromatic radicals which are optionally substituted by one or more monovalent organic groups which are inert under the conditions of use or sulfonic acid groups, R is hydrogen, an alkali metal or alkaline earth metal ion or an ammonium ion, n is an integer from 0 to 3, m is 0, 1 or 2 and X is a $-\text{CO}-$, $-\text{O}-$, $-\text{C}_p\text{H}_{2p}-$, $-\text{C}_p\text{F}_{2p}-$ or $-\text{S}-$ group, in which p is an integer from 1 to 10.

2. A sulfonated aromatic polymer as claimed in claim 1, which, besides the repeating structural unit of the formula I, comprises the repeating structural unit of the formula II

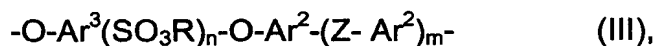


in which Ar^1 , Ar^2 , R, m and n have the meaning defined in claim 1, and Y is a $-\text{CO}-$, $-\text{O}-$, $-\text{C}_p\text{H}_{2p}-$, $-\text{C}_p\text{F}_{2p}-$, $-\text{S}-$ or $-\text{SO}_2-$ group in which p is an integer from 1 to 10.

3. A sulfonated aromatic polymer as claimed in either of claims 1 or 2, wherein X is $-\text{CO}-$.

4. A sulfonated aromatic polymer as claimed in either of claims 1 or 2, wherein Ar^1 and Ar^2 are, independently of one another, phenylene, naphthylene and/or biphenylene, in particular 1,3- and/or 1,4-phenylene.

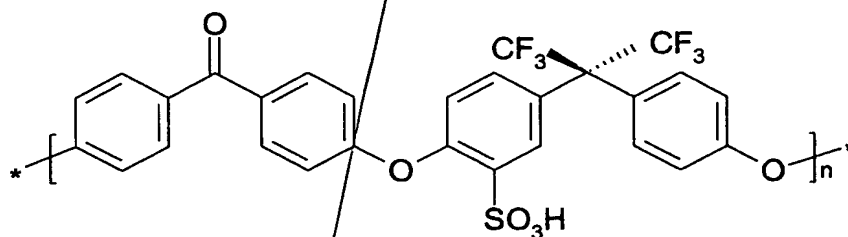
5. A sulfonated aromatic polymer as claimed in either of claims 1 or 2, which, besides the repeating structural unit of the formula I and, where appropriate, of the formula II, comprises the repeating structural unit of the formula III



in which Ar^2 , R, m and n have the meaning defined in claim 1, Z is a $-CO-$, $-O-$, $-C_pH_{2p}-$, $-C_pF_{2p}-$, $-S-$ or $-SO_2-$ group in which p is an integer from 1 to 10, and Ar^3 is a divalent aromatic or heteroaromatic radical which is optionally substituted by one or more monovalent organic groups which are inert under the conditions of use.

6. A sulfonated aromatic polymer as claimed in claim 5, wherein the molar proportion of the repeating structural unit of the formula I and, where appropriate, of the formula II is 10-50% and the molar proportion of the repeating structural unit of the formula III is 90-50%.

7. A sulfonated aromatic polymer as claimed in claim 1, which consists essentially of the repeating structural unit of the following formula:



8. A sulfonated polymer as claimed in any of claims 1 to 7, which has an ion exchange capacity of between 0.5 and 3.0 meq ($-\text{SO}_3\text{H}$)/g of polymer, preferably between 1.0 and 2.0 meq/g of polymer.

5 9. A membrane comprising a sulfonated polymer as claimed in any of claims 1 to 8

10 10. A membrane as claimed in claim 9, which has a proton conductivity in contact with liquid water, determined by impedance spectroscopy in water at 80°C, of between 120 and 350 mS/cm.

15 11. A membrane as claimed in claim 9, which comprises as further polymer component a sulfonated, aminated or else underivatized aromatic polymer, in particular a polyether sulfone, polysulfone, polybenzimidazole or polyether ketone.

12. A membrane as claimed in claim 9, which has a thickness of between 10 and 150 μm , preferably a thickness of between 20 and 60 μm .

20 13. A method for producing a membrane as claimed in claim 9, comprising the measures:

- (i) dissolving a polymer as claimed in any of claims 1 to 8 or its salt form in an aprotic organic solvent,
- (ii) spreading the solution on a support, and
- 25 (iii) evaporating the solvent to form the membrane.

30 14. The method for producing a membrane as claimed in claim 13, wherein a solution in DMF, DMAC, NMP or DMSO is prepared, with the concentration of the polymer being between 3 and 30% by weight.

15. The method for producing a membrane as claimed in claim 13, wherein the salt forms of the polymer are employed, in particular the NH_4 , Li, Na or K salts, and

wherein the salt forms can be converted into the acid form by treatment with an acid after production of the membrane.

16. The method for producing a membrane as claimed in claim 13, wherein the remaining solvent or salts are removed after the membrane production by a suitable washing medium such as, for example, a 5% strength mineral acid in water.

17. The use of the membrane as claimed in claim 9 in fuel cells, especially the direct methanol fuel cell, in electrodialysis, ultrafiltration, electrolysis or high-performance capacitors.

18. The use of the sulfonated aromatic polymer comprising the repeating structural unit of the formula (I)



in which Ar^1 , Ar^2 , R, n and m have the meanings defined in claim 1, and X' is $-\text{SO}_2-$, in fuel cells or in high-performance capacitors.

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